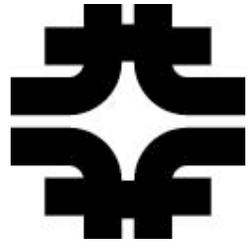


Summary of July 7 workshop

Don Petravick
Fermilab



July 7 ESNet workshop

Bill Johnstone, ESNet.

– CERN IT auditorium

- <http://agenda.cern.ch/fullAgenda.php?ida=a053665>

- Topics:

Canadian Network

LHCnet

ESNe

Abilene

T1's

(Service Challenge)

**People that have indicated to attend the ESnet meeting
At CERN on July 7 2005**

last modified: July 01 2005

Attending in person:

- David Foster (CERN, Chairman)
- Bill Johnston (ESnet)
- Scott Bradely (BNL)
- Rick Summerhill (Internet2)
- Don Petravick (FNAL)
- Harvey Newman (Caltech)
- Sylvain Ravot (Caltech)
- Jamie Shiers (CERN)
- Randy Sobie (University of Victoria)

Attending via VRVS:

- Shawn McKee (University of Michigan)
- Bill St. Arnaud (Canarie)
- Greg Cole and/or Natash Bulashova (Gloriad)
- Rene Hatem (Canarie)
- Reda Tarifout (Triumpf)
- Craig Tull (DoE) *via phone*

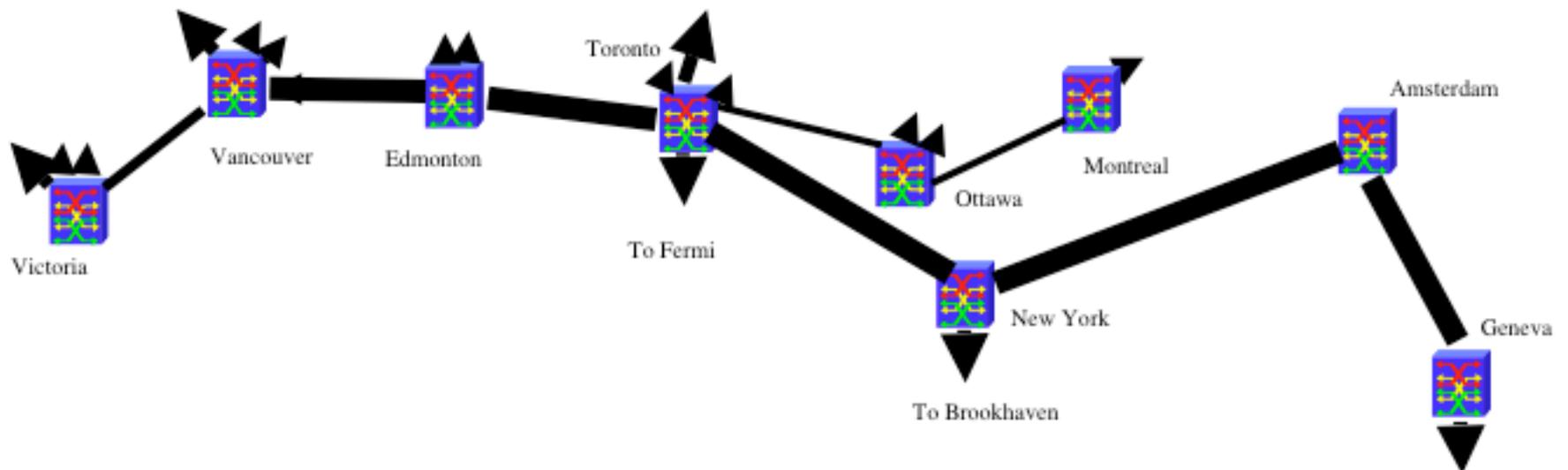
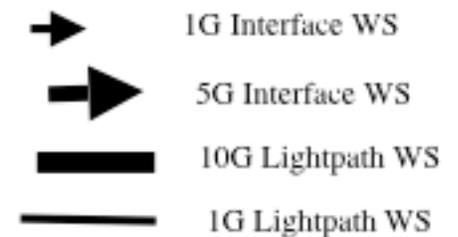
CANARIE link to CERN

10 G APN (articulated private network): Van-Edm-Tor-NY

5 G APN NY-Amsterdam-Geneva

1-2 G APN Van-Vic and Tor-Ott-Mon

APN can then be subdivided into lightpaths.





LHCNet topology and Operation

US T0-T1 Meeting

July 7, 2005

Sylvain Ravot



Major US-Partners



Chicago (Starlight)

- * FNAL (10 Gbps; 6 x 10 Gbps this year)
- * ESnet (10 Gbps)
- * U. Michigan (10 Gbps; 3 x 10 Gbps this year)
- * FIU/UF (10 Gbps via NLR & FLR)
- * Caltech (10 Gbps via NLR)
- * USnet (2 x 10 Gbps)
- * HOPI (2 x 10 Gbps)
- * U. Wisconsin Madison (10 Gbps via Starlight)
- * TeraGrid (10 Gbps via Starlight)
- * Abilene (10 Gbps via Starlight)

**9 to 16 10GE
waves in
2005**

New-York (MANLAN)

- * BNL (10 Gbps in 2006)
- * ESnet, Abilene (10 Gbps via MANLAN)
- * HOPI (2 x 10 Gbps)
- * CANARIE (3 x 10 Gbps)
- * NLR
- * Buffalo (2 x 10 Gbps)
- * Atlantic Wave (10 Gbps)

**8 to 10 10GE
waves in
2005**



LHCNet and ESNNet Sept. 2005

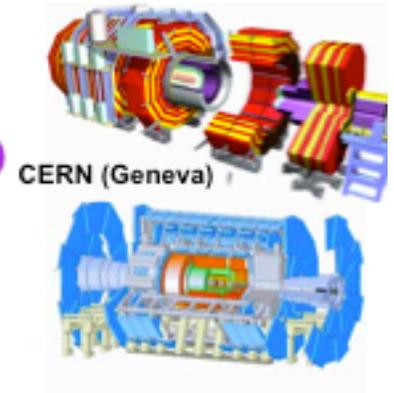
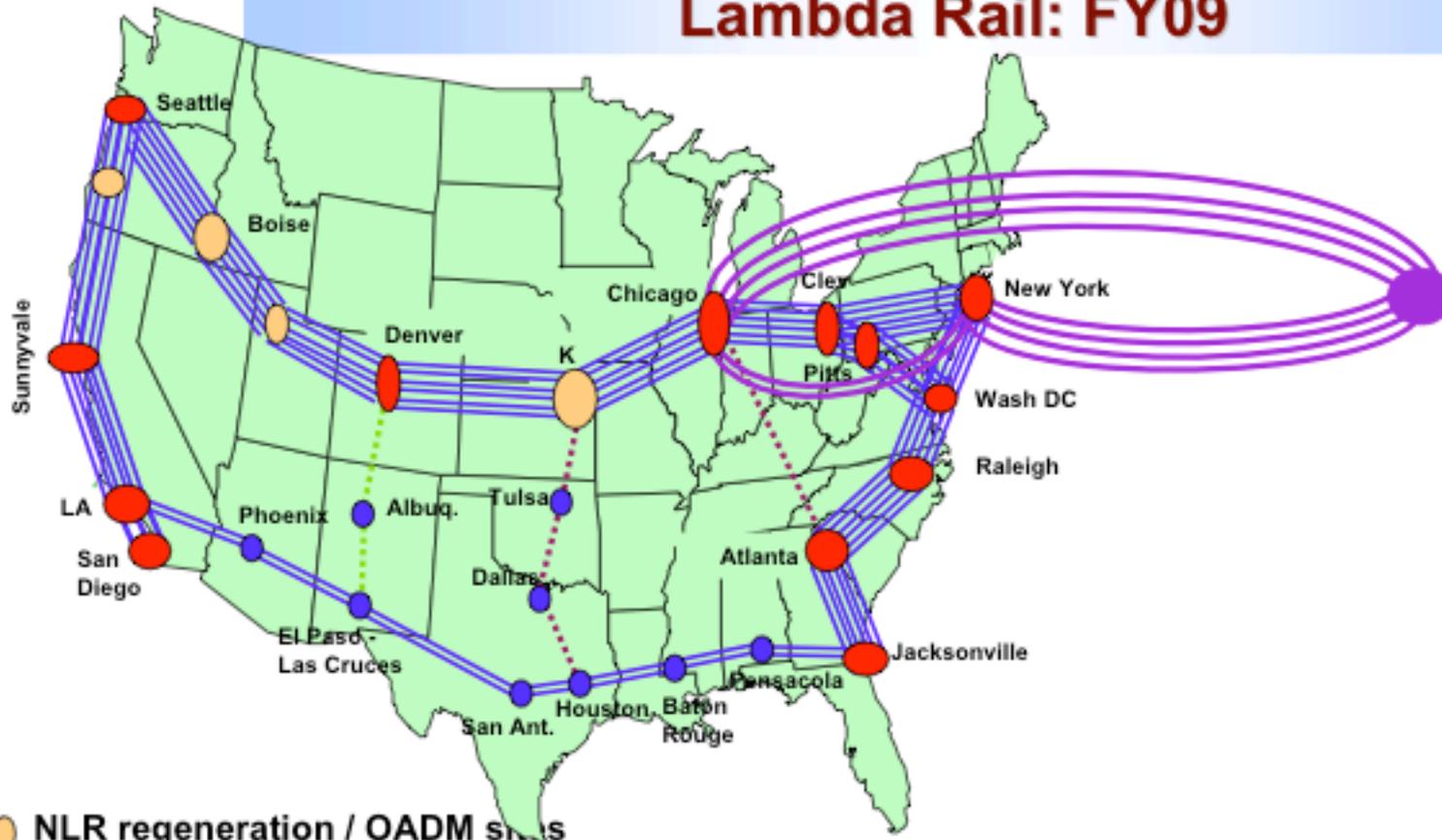


- HUB
- ◆ Major DOE Office of Science Sites
- ◆ High-speed cross connects with Internet2/Abilene
- Production IP ESnet core, 10 Gbps enterprise IP traffic
- USNet 10 Gbps circuit based transport. (DOE funded project)
- Major international
- LHCNet Data Network (10 Gb/s)
- NSF/IRNC circuit; GVA-AMS connection via Surfnet or Geant2 (10 Gb/s)
- 10Gb/s
- ≥ 2.5 Gb/s

◆ Connections to ESnet Hubs in New-York and Chicago
 ◆ Multi-lambdas (10 Gbps) to BNL and FNAL
 ◆ Access to USNet for R&D



LHCNet connection to Proposed ESnet Lambda Infrastructure Based on National Lambda Rail: FY09

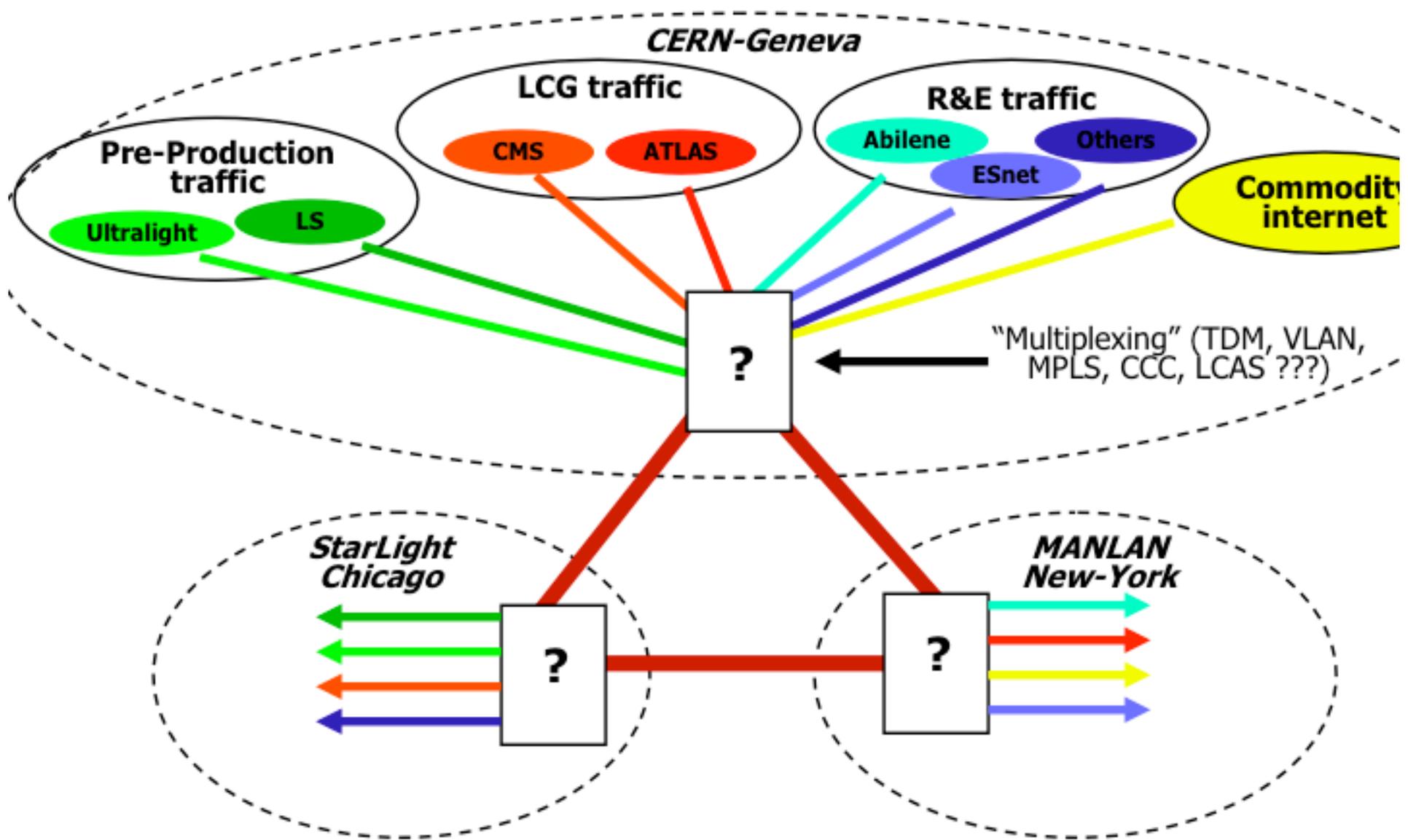


- NLR regeneration / OADM sites
- NLR wavegear sites
- ESnet via NLR (10 Gbps waves)
- LHCNet (10 Gbps waves)

◆ LHCNet: To ~80 Gbps by 2009
◆ Routing + Dynamic managed circuit provisioning

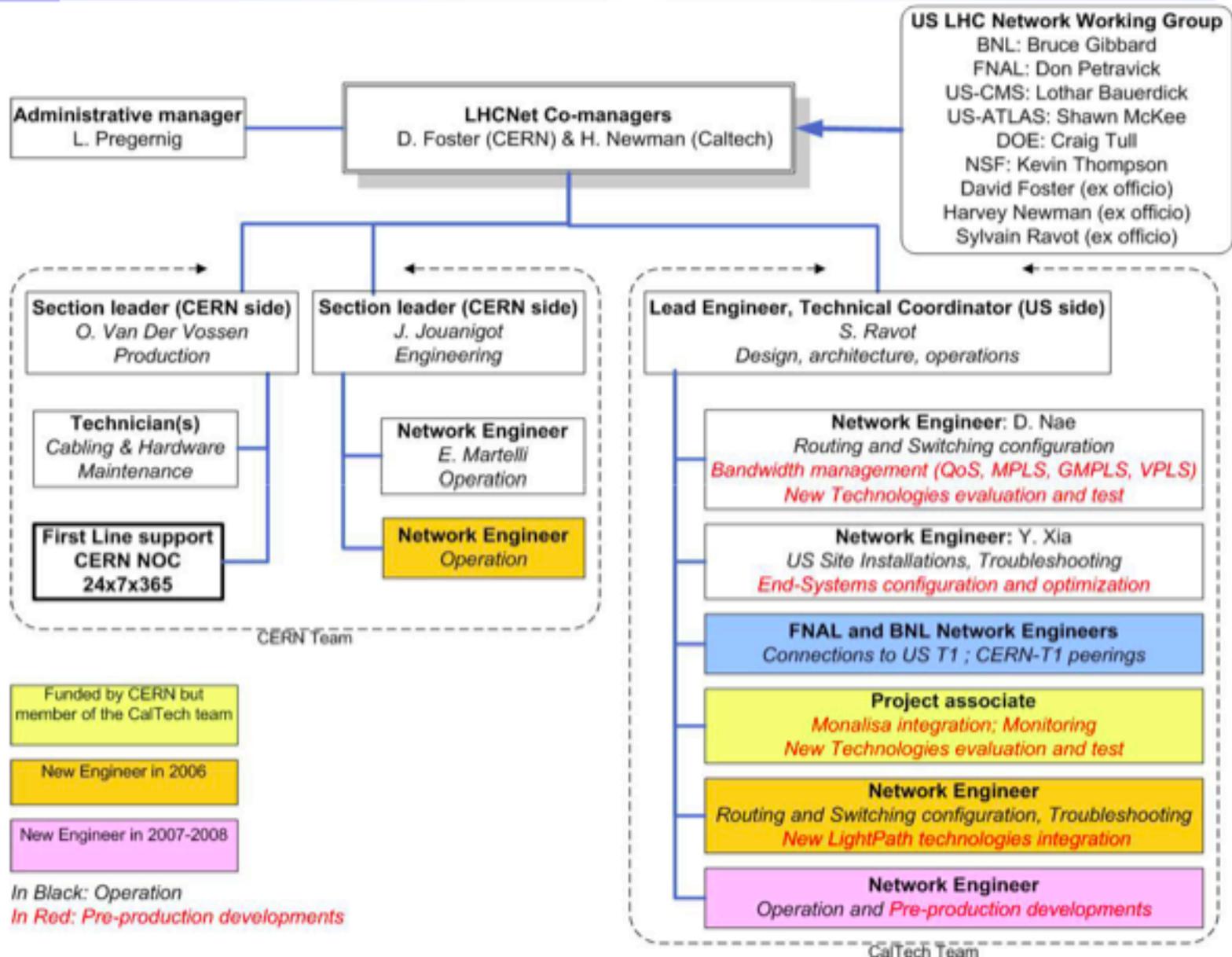


Design





Organization Proposal





Internet2 Next Generation Network Design Ideas

Rick Summerhill

Director, Network Research, Architecture, and
Technologies, Internet2

June 7, 2005

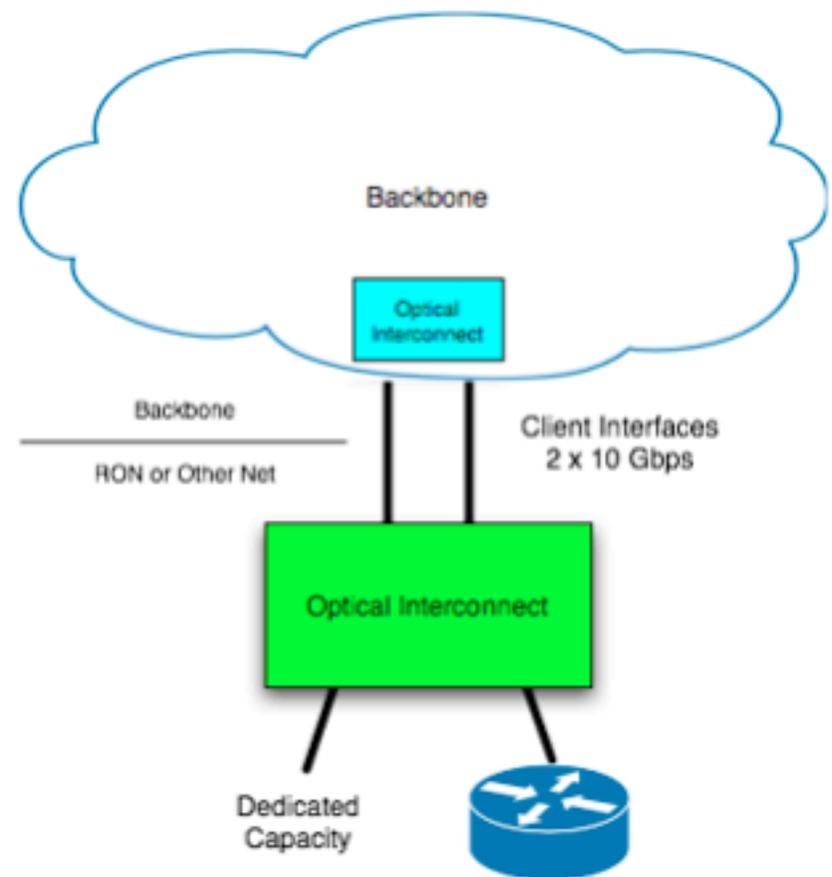
LHC Network Meeting
CERN, CH

- October 2007 - End of recent 1-year Abilene transport MoU extension
 - Sets next-generation network planning timeline
 - Architecture definition: 1/1/2006
 - Transport selection: 4/1/2006
 - Equipment selection: 7/1/2006
 - Backbone deployed: 1/1/2007
 - Connector transition: 2007
 - Concurrently, review overall business plan and management model
 - Network design time frame: 2007-2012
- HOPI testbed is expected to be in place for 2-3 years, to experiment with future protocols
 - Refine and evolve next generation architecture

Connector Interface

The interface to the backbone:

- Two or more client interfaces between optical interconnects (analogous to router-to-router connections today)
- Requirements:
 - Support connectivity to IP Network
 - Support multiple sub channels through backbone to other RONS up to capacity of interface





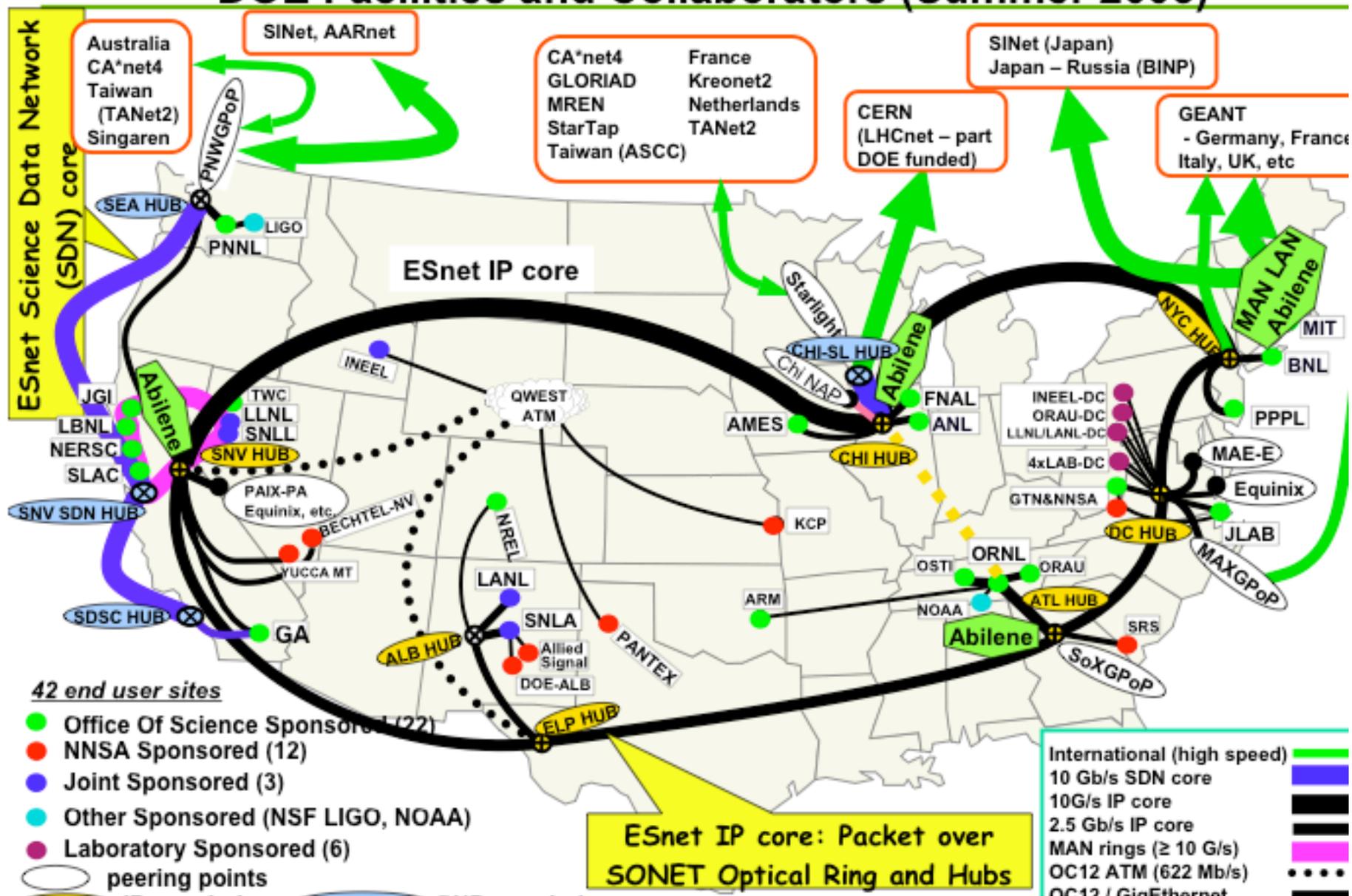
ESnet Planning for the LHC T0-T1 Networking

William E. Johnston
ESnet Manager and Senior Scientist

Lawrence Berkeley National Laboratory



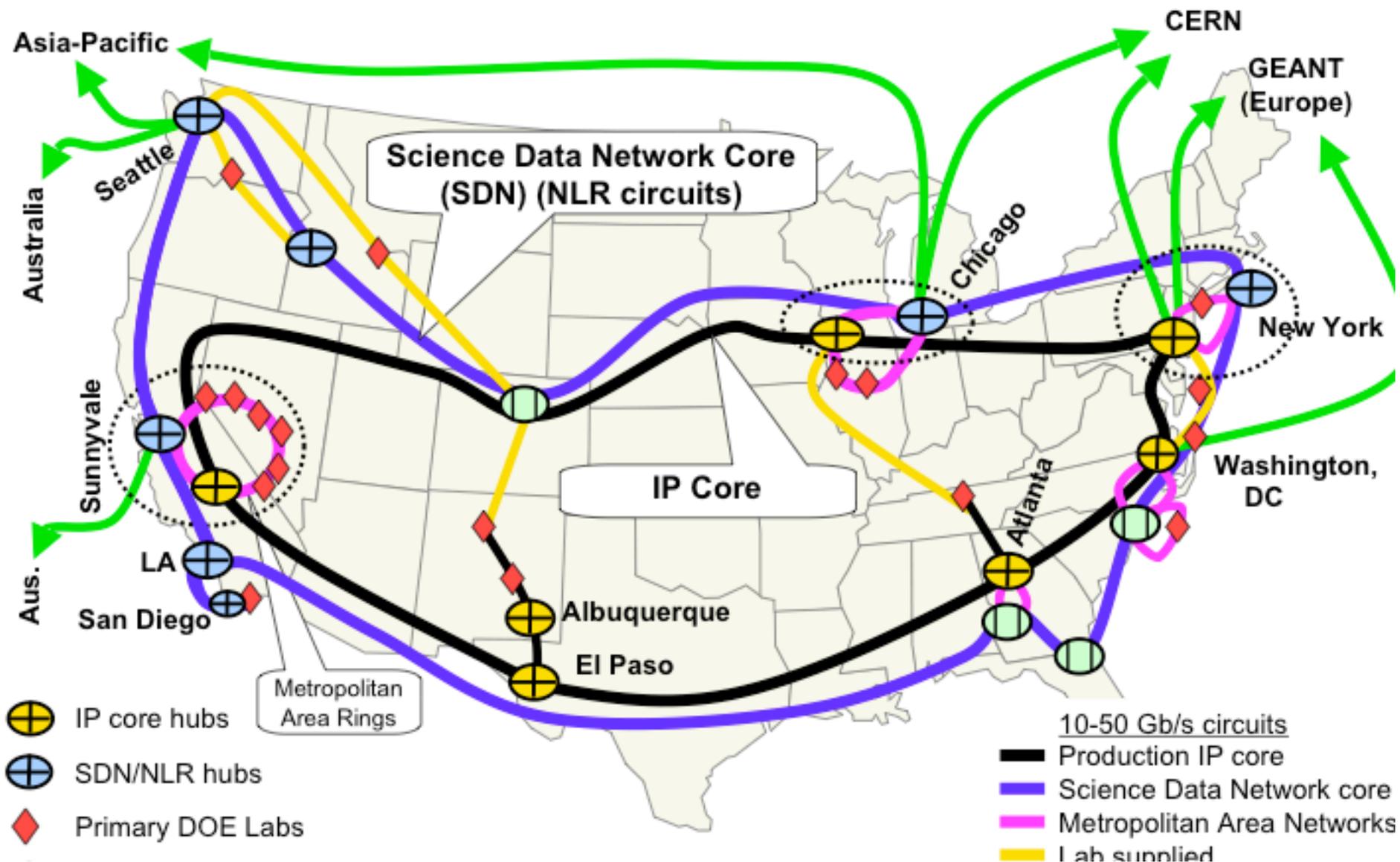
ESnet High-Speed Physical Connectivity to DOE Facilities and Collaborators (Summer 2005)



ESnet

- The IP core is primarily a layer 3 infrastructure
 - However, supports layer 2 via MPLS
 - Directly connects sites
 - Provides global peering for sites
- The SDN core is primarily a layer 2 infrastructure
 - Targeted at providing virtual circuit services
- Site connectivity is evolving to be Metro Area Network rings
- Goal is two independent core rings that are interconnected at various locations with metro area rings

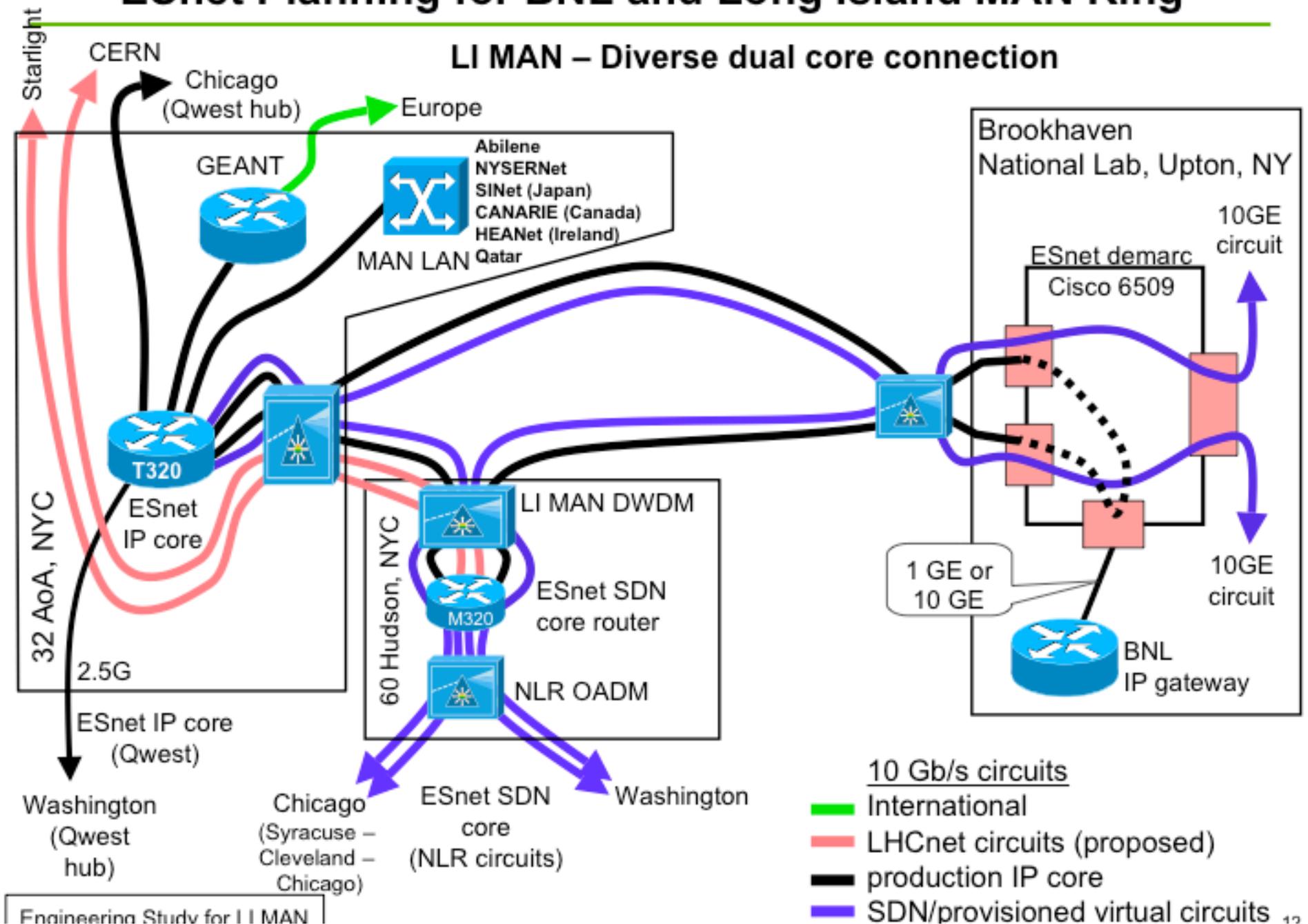
ESnet Target Architecture: IP Core+Science Data Network Core+Metro Area Rings



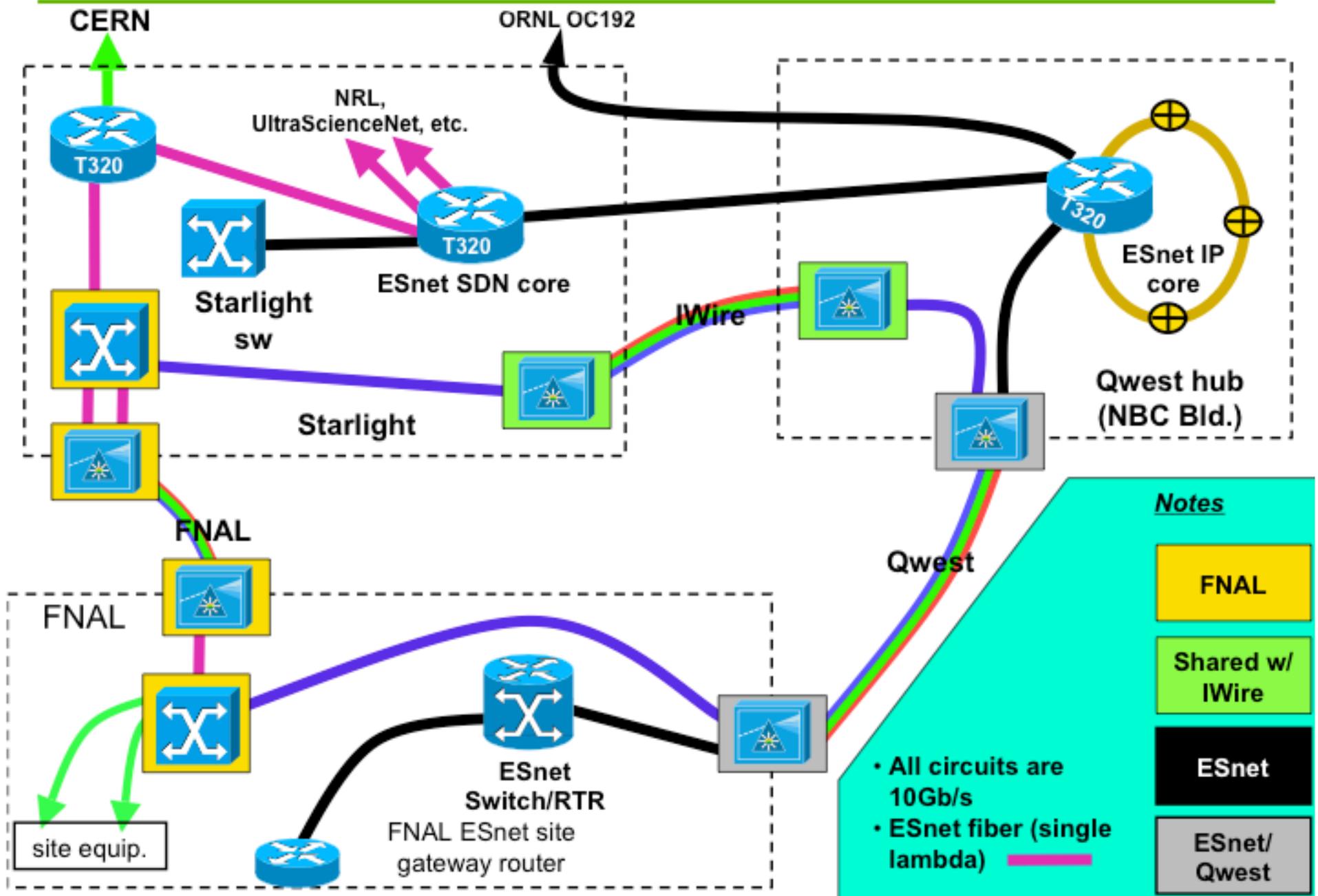
Proposed ESnet Upgrade Schedule

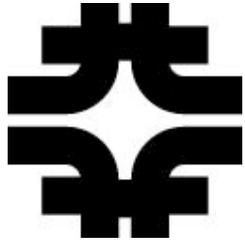
- ***Fiscal Year 2005***
 - FNAL-ANL-Chicago Metropolitan Area Network
- ***Fiscal Year 2006***
 - BNL MAN
- ***Fiscal Year 2007***
 - Extend Science Data Network (SDN) from Seattle=>New York/Washington, DC at 10G. Jefferson Lab MAN.
- ***Fiscal Year 2008***
 - Science Data Network (SDN) loop around the country at 10G. ORNL MAN.
- ***Fiscal Year 2009***
 - Double main Science Data Network (SDN) links to 20 Gigabits.
- ***Fiscal Year 2010***
 - Increase main Science Data Network (SDN) links to 30 Gigabits per sec. PPNL MAN.

ESnet Planning for BNL and Long Island MAN Ring



ESnet Near-Term Planning for FNAL (≈mid-late 2005)





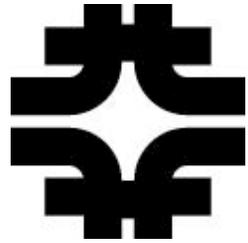
FNAL input

- The satisfaction of the US HEP community is very important to Fermilab.
- The CMS T1 center at Fermilab is the only center in the hemisphere. There are many presentations where all T1's are of equal capacity. These sorts of presentations understate what is required in the US.
- US CMS view the weight of the FNAL at 2-3 times a nominal T1.
- Fermilab has the experience and potential to ingest and serve all the data if needed as a permanent or temporary contingency.
- Do not under-estimate the technical contingency well-provisioned networking will provide the LHC project during shake down.
- Inadequate Transatlantic network would have to be mitigated by more storage, acceptance of delays and more planning.

US ATLAS Tier 1 Computing Facility

❄ Functions

- ❑ Serve as primary U.S. ATLAS & ATLAS data repository
- ❑ Reconstruction $1/n^{\text{th}}$ of ATLAS data archived at BNL
- ❑ Programmatically select and distill reconstructed data
- ❑ Support “*Chaotic*” high level analysis by individuals
- ❑ Generate Monte Carlo data
- ❑ Supply technical support for smaller US computing resource cent



Discussion

- Many criticized the TDR network requirements as characterizing part of the problem, leaving out other parts of the problem.
- Funding for ESNet plans is TDB.
- Abilene futures were quite tentative.